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# BUSINESS MODELS FOR OFF-GRID RURAL ELECTRIFICATION WITH RENEWABLE ENERGY TECHNOLOGIES

# Consultant Terms of Reference

## BACKGROUND

### Project background

*<Rationale for the project, project history>*

### Open Market sales

*<Background on use of open market sales in the country and potential under the project>*

### Market Packages with Public/Private Arrangements to Rural Electrification using PV Systems

*<Background on use of open market sales in the country and potential under the project>*

A “market package” is a public-private partnership that is defined here as consisting of a group of potential users clustered in a contiguous area, including households and public facilities (a bundled economic package). The winning private company is awarded a contract to install systems in public facilities and Government or development agencies subsidy support in return for a commitment to provide service and/or deliver certain installation targets for a certain period. MPs are identified and prepared by the Government.

A market package typically includes a contract to install and service PV systems in public facilities bundled together with an obligation to achieve, using some form of competitive “dealer model”, a minimum number of system sales, with a specified minimum of after sales service, to households within the targeted area. The contract for public facilities installations and service is intended to provide at least the critical minimum base load for the company to sustain its operations in the area. The basic model used in multiple countries is the *Sustainable Solar Market Package* (SSMP) model developed initially in the Philippines under RPP. Variations on the basic model are many, for instance the medium term service contracts implemented in Bolivia under IDTR and the target market model implemented in Uganda under ERT. The differences among the SSMP model as implemented in various countries include: system sizes and specifications; the manner by which subsidy levels, eligibility and disbursements are determined; the time periods for initial installations and the required service-after-sales maintenance and warranties; and other obligations that may be imposed on the winning company.

Critical SSMP design choices are the period of the mandatory service and maintenance obligations, subsidies for the household connections, equipment and service quality standards, monitoring and enforcement.

Participating private companies carry significant market and other risks under the SSMP approach, as they do under the basic dealer model. An SSMP is typically structured with financial and capacity building elements that are tailored to mitigate these risks as much as possible (BDS support, technical support, monitoring support, marketing support, financial subsidies, credit, credit enhancements) in efforts to elicit the entry of companies into deep rural markets and communities that they might otherwise not enter.

The readiness and capacity of the public sector entities to participate effectively are as critical to the success of SSMP partnerships as are the risk appetite and capacities of the private companies to enter these markets and communities. These factors are specific to each context, and there is only limited scope to generalize on the feasibility of an SSMP approach from one market, community and institutional context to another.

### Universal rural electrification service models using individual PV for off-grid services

Under ESCO and concession models the operating entity provides *electricity service* to users on a fee basis. It installs PV systems and provides continuous O&M service. Many variations of these models are possible.

Under a purely commercial market model, ESCO service terms and conditions are set by the provider, in many cases without coming under the purview of a sector or other regulator. Under a public private partnership, key terms and service conditions may be regulated by the PPI contract or by the sector regulator. Under a national program, the tariffs, equipment and service quality standards may be regulated by the sector regulator, and the obligation to provide off grid services may be incorporated within the service obligations of area concession holders that more traditionally provide only grid based distribution services.

For countries targeting universal access to electricity service, business models that deliver sustained electricity services to rural off-grid households and facilities, as opposed to the development of private markets for PV product sales and services, are an option. Early examples of the “mainstreaming” of PV systems for off-grid services within a universal service access program are Argentina and Morocco. For current business models, most relevant for the [Country] context might be the Philippines and Peru, both with a current electrification ratio of about 85%. Six existing distribution utilities in the Philippines introduced PV based services in off-grid communities on a trial basis in 2011. The most recent example for this regulated utility approach is currently Peru, which incorporated off-grid services within the sector regulatory framework over 2007 – 2010; four Peruvian electricity distribution companies and one new private provider (an NGO) over 2011-2012 have installed 9,000 individual PV systems for services to off-grid households within their concession zones. Another current variant is South Africa, which has established separate concessions for the provision of off-grid services with PV systems in rural communities.

As with the introduction of an SSMP model, the feasibility of a universal service rural access model depends on the readiness and capacity of both the private and public sectors, and it is necessary to assess readiness and capacity on a case by case basis as the market, community and institutional contexts will vary.

### Role of Non-PVs Small-scale, Standalone RETs in Off-grid Electrification

In general, renewable energy technologies other than PV have a potentially significant role to play in off-grid rural electrification in [Country], given the presence of economically exploitable amounts of hydro, wind and biomass resources in many parts of the country. For [project], however, the scope of investments is limited to non-grid connected RETs. Therefore, this would likely exclude RET power systems that have sufficient size and located not too far from the grid (e.g., mini hydro), such that the more economic investment option is likely to be grid-connection and export of power, even as connection is made possible to previously unelectrified communities near the power plant.

However, investment even in a small stand-alone RET power plant (micro hydro or small wind turbine, for example) in a remote area to serve a small and dispersed population is often economically justified only when a relatively large productive application that can use the excess power can be developed. This has proved extremely difficult to do in practice. In most cases, household lighting is the main end use. The most economic and practical option is often simply to provide individual systems, mainly PV, since they work practically everywhere in [Country]. In a few instances where low head water resources are available and could be used with minimal or no civil works, pico hydro systems (<1 kW) may be an alternative. In areas with good wind speeds, small wind turbines (< 5 kW) with output shared by several users, may also be practical. However, unlike solar radiation, both hydro and wind resources are very site-specific so their aggregate potential for providing basic electricity supply in off-grid areas of [Country] is likely to be miniscule compared to PV. In addition, the RE-RE and RE-diesel hybrids might be economically viable and technologically feasible in certain communities.

## OBJECTIVE

The objective of the present consultant assignment is to design an indicative implementation plan for the off-grid electrification part of [project]. A companion study is expected to be conducted, which will focus on enabling regulatory conditions needed to promote off-grid electrification, and is expected to take into account the findings from the current work.

## CONSULTANT TASKS

### Task A. Expanding the dealer model based Open Market PV Program

1. Review the results and conclusions of the consultant report [relevant report(s) on existing experience]. Augment with additional work as necessary to gain a full understanding of the model used to date and its impacts. Within the review of the [relevant report(s)], note any social or gendered trends that are taking place, either within user groups or markets that may be useful to informing future actions.
2. Review the literature on the experience in implementing dealer model-based PV programs in other countries (e.g., Sri Lanka ESD/RERED, Nicaragua PERZA). Note differences, if any, in the elements and procedures used by specific programs to implement the dealer model in their particular cases. Identify elements that appear to be critical to success of certain programs compared to others, including the participation and consultation process with male and female users/beneficiaries, with a view to potential adoption in [Country].
3. Based on the results of the above reviews and the consultant’s own expertise in this field identify specific actions that could be carried out under the [project name] to improve the operational performance of the proposed expanded PV program, widen geographic coverage and increase the total number of PV installations in the country over the next 5 years. The actions should include addressing key issues identified in the [relevant report name(s)], related to the performance of participating PV companies and microfinancing institutions, as well as overall consumer satisfaction and considering the needs and roles of both men and women. Also, identify the limits and limitations of expanding under this model.
4. Broadly identify the potential if any for new geographic areas that the current open market program could focus attention on, based on Government regional development priorities, income levels in the areas, and readiness and capacities of participating companies and MFIs. Estimate potential sales volumes in these areas in the next 5 years under the open market mechanism.

### Task B. Defining a Competitively-Bid Sustainable Solar Market Package Mechanism

1. Review international experience of the SSMP and other similar models as implemented in countries such as the Philippines, Peru, South Africa and Bolivia. If possible, obtain a copy of the programs concept note and contracts between the winning bidder and the Government and review the provisions. Note differences, if any, in the elements and procedures used by the reviewed countries to implement their version of the SSMP model. In particular, analyze procedures employed in each case, including the following:
   1. Identification and sizing of packages: what criteria were used to identify geographic locations and determine minimum size of packages?
   2. Level and terms of subsidy: What bases were used to determine the total subsidy for the packages? What were the sources and percentage share of each source for the subsidies? How was the payment plan (timing) for the subsidy established?
   3. Setting of connection targets, penalty/reward system for achieving goals: How were installation or connection targets set? Was there a different timetable for public facilities and households?
   4. Why was the no-concession mechanism chosen to implement the projects?
   5. How is the financial and technical sustainability achieved under this mechanism?
   6. What would be the roles of the private and public sectors under this model?
   7. Consideration of end-users and beneficiaries: Was this part of the package and design? Did it have any impact on successful implementation? Were both men and women consulted with feedback integrated into the design?
2. Broadly identify the potential for geographic areas that could be served using the SSMP approach, based on Government regional development priorities, income levels in the areas, and the readiness and capacities of the [Country] private and public sectors. Estimate potential sales volumes in these areas in the next 5 years under a SSMP mechanism.
3. Analyze the current readiness and capacity of the private and public sectors in [Country] to develop a universal service model for electricity services in off-grid communities under the present sector structure and the political, economical, cultural and geographical conditions.
4. Based on the above reviews and analyses, determine the feasibility of implementing an SSMP model in [Country].
5. If assessed as feasible:
   1. Recommend a specific SSMP market package mechanism that appears most suited to the conditions in [Country]. The model need not be patterned exactly after any specific one being practiced in the above countries but could be a mix of ingredients found in the various models. Explain why the recommended ingredients and model are likely to be more workable in [Country].
   2. For demonstration, identify and conceptualize the development of an indicative initial market package based on the proposed mechanism that could be implemented in the short term.
   3. Outline a procedure for implementing the SSMP approach in [Country], from preparation to competitive bidding to awarding of the contract and execution of the project by the winning company. The output would include the description of the following tasks:
6. Identification of preparatory tasks still pending, e.g., a WTP survey of the area.
7. Estimation of the project costs, including subsidy requirements.
8. Outline of the terms of the contract.
9. Structure of the bidding process.
10. Approximate timeline for execution.
11. Institutional responsibility for each implementation step.
    1. Determine the need, if any, for setting up a regulatory framework for this type of projects. Note that a separate consultant study will be carried out to develop the detailed framework. Recommend specific items that must be included in that study.

### Task C. Defining a universal service rural access model

1. Review the experience of countries approaching universal access that have mainstreamed the provision of electricity services for rural off-grid communities and households using individual PV systems, including the current experience of Peru, South Africa and the Philippines. If possible, obtain a copy of the programs concept note and relevant contracts and review the provisions. Note differences, if any, in the elements and procedures used by the reviewed countries to implement their version of this universal service access model. In particular, analyze procedures employed in each case, including the following:
   1. Identification and sizing of the off-grid services;
   2. Level and terms of subsidy: What bases were used to determine the total subsidy for the packages? What were the sources and percentage share of each source for the subsidies? How was the payment plan (timing) for the subsidy established?
   3. Setting of connection targets, penalty/reward system for achieving goals: How were installation or connection targets set? Was there a different timetable for public facilities and households?
   4. Why was this mechanism chosen to provide access?
   5. How is the financial and technical sustainability achieved under this mechanism?
   6. What would be the roles of the private and public sectors under this model?
   7. Consideration of end-users and beneficiaries? Was this part of the package and design? Did it have any impact on successful implementation? Were both men and women consulted with feedback integrated into the design?
2. Broadly identify the potential for geographic areas that could be served using auniversal service rural access model, based on Government regional development priorities, income levels in the areas, and the readiness and capacities of the [Country] private and public sectors. Estimate potential connection volumes in these areas in the next 5 years under a universal service access mechanism.
3. Analyze the current readiness and capacity of the private and public sectors in [Country] to develop a universal service model for electricity services in off-grid communities under the present sector structure and the political, economical, cultural and geographical conditions.
4. Based on the above reviews and analyses, determine the feasibility of implementing a universal service rural access model in [Country].
5. If assessed as feasible:
   1. Recommend a specific universal service rural access mechanism that appears most suited to the conditions in [Country]. Explain why the recommended ingredients and model are likely to be more workable in [Country].
   2. Outline a procedure for implementing a universal service rural access approach in [Country]. The output must include the description of the following tasks:
6. Identification of preparatory tasks.
7. Estimation of the project costs, including subsidy requirements.
8. Approximate timeline for execution.
9. Institutional responsibility for each implementation step.
   1. Determine the requirements for setting up a regulatory framework for mainstreaming universal service in rural communities, including the regulation of service obligations, tariffs, equipment and service quality standards. Note that a separate consultant study will be carried out to develop the detailed framework. Recommend specific items that must be included in that study.

### Task D. Outline of Indicative Implementation Plan for an Expanded Off-grid Rural Access Program

Each of the models identified should, at a minimum, include features that are commonly found in successful rural electrification globally such as:

* Robust distribution scheme with adequate incentives and capacity to reach distant and dispersed rural communities
* Balanced approach between cost recovery and affordability with the judicious application of targeted subsidies when necessary
* Establishment of standards and specification to inform consumers and ensure adequate quality of equipment and services
* Availability of convenient aftersales care to enhance the prospects for sustaining the benefits of the RE investments

Taking into account these important features and the results of Tasks A, B and C:

1. In consultation with the [Country Government] identify and prioritize the geographical areas where the PV dissemination under [project name] will be developed.
2. Outline a five-year indicative plan for off-grid PV dissemination under [project name], consisting of a combination of approaches, with goals set in terms of number of installations and/or total kWp installed. Estimate the approximate number of PV systems that could be disseminated under the project (including for productive uses), using available data and information, including: market shares of the different capacities based on past experiences; current market cash price (unsubsidized) of each capacity; available grant funds in [project name] for subsidies, and estimated user contributions. Provide guidance on participatory consultation methods with women and men users and beneficiaries that help facilitate implementation.
3. Set yearly targets and investment costs. Break down the annual estimated installation targets into domestic PV, productive and institutional PV.
4. Recommend an appropriate institutional arrangement that would enable the Government to effectively manage the implementation of a significantly expanded PV program.

### Task E. Selective Promotion of non-PV small scale, standalone RETs

1. Roughly quantify the potential of RETs other than PV for power supply for off-grid communities of [Country] in general and their potential role in the [project name], based mainly on projects that have been already identified by different governmental and non-governmental organizations. Based on this quantification, recommend the optimal allocation of effort and funds for non-PV RETs and the PV program in implementing [project name].
2. Broadly identify, based on available data and information, the regions/[other administrative divisions]/communities, where these RET applications could be promoted.
3. Compare pico-hydro and small wind power to PV for domestic electrification, in terms of specific benefits to users, pre-investment requirements and costs, energy delivered, capital cost per user or levelized energy cost, O & M costs, lead time to realize an installation and overall sustainability. When considering a potential productive application as a benefit for a RET option, assess whether such an enterprise can realistically or potentially be established and financially sustained in the remote community.
4. Recommend business models for development of both pico-hydro and small wind power. Review the national experience in this matter and assess whether the business models recommended in the previous sections of this study for solar PV could be applied to these other RET.
5. Review the existing experience in [Country] and other countries regarding small-scale, standalone RE-RE and RE-diesel hybrid systems and evaluate its potential for [Country].

### Task F. Workshop to develop consensus and disseminate findings, recommended business models and indicative plan

The consultant is expected to participate in a minimum of two workshops or as necessary to disseminate information related to findings and recommendations at different stages of the assignment with the intention of developing consensus amongst [Country Government] and other stakeholders. The workshop logistics will be arranged by [Country Government] and the consultants will be responsible for preparing the presentation and other materials related to the assignment for dissemination, and for participating in the discussions at the workshops.

## COORDINATION AND PARTICIPATION

This assignment is to define the readiness and capacity of the private and public sectors in [Country] to implement different approaches to increasing the use of individual PV systems in remote rural communities, to identify strengths and weakness of the likely key stakeholders, to define potentially viable models and interventions and to build support and capacities to implement the models under a medium term plan.

The consultant will report to the [Donor and/or Country counterpart]. The consultant will be teamed with an energy specialist with PV based electrification experience in [Country].

## KEY DELIVERABLES

The consultant, at a minimum will prepare the following outputs:

1. A PowerPoint presentation on the initial findings and potential options for expanding off-grid electrification in [Country]
2. A PowerPoint presentation of the final approach and recommendations for the business models to be presented at second workshop
3. A final report that will consist of the analysis and the Indicative Implementation Plan for an Expanded Off-grid Rural Access Program**,** as described under Task D.

## LEVEL OF EFFORT

It is estimated that this effort will require 45-50 days, which may be extended based on needs and circumstances, as determined by the [responsible counterpart].